

# Prevalence of Extramural Uncinate Process and its Correlation with Sex: A Computed Tomographic Study

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## ABSTRACT

**Introduction:** Extramural uncinata process i.e pneumatization of uncinata process is the extension of the Agger nasi cell within the anterior and superior portion of the uncinata process. It is supposed to be related to osteomeatal obstruction, narrowing of the infundibulum and producing impaired sinus ventilation. The present study was conducted to observe the prevalence of pneumatization of uncinata process and its relationship with gender.

**Material and methods:** Computed tomographic (CT) images of sinonasal region (100 subjects; 62 males and 38 females) were obtained from the Department of Radiodiagnosis, King George's medical University, Lucknow, from the period Aug 2013 to July 2014. The CT scans were analyzed to determine the prevalence of pneumatization of uncinata process and its relationship with gender.

**Results:** Out of total 100 subjects studied, uncinata process pneumatization was found in 4% of study population which included proportionately higher number of male subjects (4.84%) than female subjects (2.63%). This difference was statistically insignificant ( $p=0.585$ ). Unilateral UP pneumatization was found in higher proportion of females (2.63%) as compared to males (1.61%) but this difference was not found to be statistically significant ( $p=0.724$ ). Bilateral Uncinate process pneumatization was found only in males (3.23%) and not in females insignificantly ( $p=0.263$ ).

**Conclusion:** In the present study prevalence of extramural uncinata process was observed to be high suggesting further work in this field to determine its correlation with pathological conditions of sino nasal region.

**Keywords:** Extramural, Uncinate process, pneumatization, computed tomographic images.

## INTRODUCTION

The lateral wall of the nasal cavity consists of an Osteomeatal complex (OMC) that includes maxillary sinus ostium, ethmoidal infundibulum, the Uncinate process (UP) and bulla ethmoidalis. Uncinate process is a thin semilunar piece of bone projecting downwards and backwards from the ethmoidal labyrinth.<sup>1-4</sup> Any anatomical variation or mucosal hypertrophy may cause stenosis of OMC causing obstruction and stagnation of secretions leading to chronic rhinosinusitis. One such variation is pneumatization of uncinata process that can cause narrowing and ventilatory impairment of osteomeatal complex resulting into pathological consequences for which uncinectomy becomes mandatory.<sup>2</sup>

The ethmoid bone is having two labyrinths filled with three air cell groups (anterior, middle, and posterior) that exhibits highly variable arrangement.<sup>5-8</sup> The extensions of these cells within the ethmoid complex are intramural, and extensions to the middle turbinate, superior turbinate, the uncinata process, agger nasi, sphenoid bone and orbital plate of the maxilla are extramural giving rise to anatomical variations like concha

bullosa, pneumatization of superior turbinate, pneumatization of the uncinata process, Agger nasi cells, Onodi cells, and Haller's cells respectively.<sup>9-12</sup> The extension of the Agger nasi cell within the anterior and superior portion of the uncinata process results in Pneumatization of uncinata process.<sup>13-15</sup> Aim of the present study was to analyze the overall prevalence of extramural uncinata process from coronal and axial CT scans and its correlation with sex.

## MATERIAL AND METHODS

Sinonasal computed tomographic images of 100 subjects (62 males and 38 females) were obtained from the Department of Radiodiagnosis, King George's Medical University (KGMU), Lucknow, from the period August 2013 to July 2014 and were analyzed for the presence of extramural uncinata process. Ethical clearance from the college ethical board and the informed consent from the patients was obtained before the start of the study.

All patients' males or females, 15 to 60 years of age, undergoing computed tomography of sinonasal region, in the Department of Radiodiagnosis, KGMU were included in the study. Any person with obscured or altered sinonasal anatomy due to inflammatory disease, previous surgery, facial trauma and paranasal sinus neoplasms. The observed variations were analyzed and noted.

## Method

Coronal sections were performed in a plane perpendicular to axial plane with the patient in prone position with extended neck. Axial sections were acquired in a plane parallel to the hard palate with the patient in supine position. The slice thickness was kept 5 mm, table feed 7 mm and pitch 1.4. Images were reconstructed at 4 mm intervals with an image overlap of 1 mm. We considered Pneumatization of the uncinata process as the extension of the agger nasi cell within the anterosuperior portion of the uncinata process. In coronal CT scan of the posterior sections the uncinata process can be visualized as a thin bone with a posterior free edge that is attached to the inferior turbinate inferiorly.

## STATISTICAL ANALYSIS

The comparison of extramural uncinata process and its association concerning the gender was conducted using the

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Chi square statistical test with Statistical Program for Social Science (SPSS) version 16.0. A p-value < 0.05 was considered statistically significant.

**RESULTS**

Majority of female and male subjects i.e 97.37% and 95.16% respectively did not show any uncinat process pneumatization (Extramural Uncinate process cells). Uncinat process pneumatization was found in 4% of study population which included proportionately higher number of male subjects (4.84%) than female subjects (2.63%). This difference was statistically insignificant (p=0.585). Both bilateral as well as unilateral of extramural uncinat process cells were seen during the course of study. Unilateral UP pneumatization (Figure-2a) was found in higher proportion of females (2.63%) as compared to males (1.61%) but this difference was not found to be statistically significant (p=0.724). Bilateral Uncinat process pneumatization (Figure-2b) was found only in males (3.23%) and not in females and this difference was not found to be statistically significant (p=0.263) (Table-1, Figure-1).

**DISCUSSION**

The uncinat process is functionally essential for the proper ventilation and drainage of the nasal cavity and the sinuses rather than being just a vestigial remnant.<sup>3</sup> The reported prevalence of Pneumatization of uncinat process ranges from 7-10.9% in the literature.<sup>3,10,13,15-17</sup> The extension of the Agger nasi cell within the anterior and superior portion of the uncinat process results in Pneumatization of uncinat process.<sup>3</sup> In present study, Pneumatization of uncinat process was observed in 4 patients (4%) which is similar to that as was reported in Italian<sup>11</sup> population. Gupta<sup>2</sup> et al, reported a prevalence of 4.34% in Indian population. The prevalence was found to be low in Caucasian<sup>3</sup> and UK Population<sup>4</sup> (Table-2). Bolger<sup>3</sup> et al, report its prevalence as 2.5% in sinus patients and Kennedy and Zinreich<sup>16</sup> as 0.4% in non-sinus patients.

In consensus with the findings of Kayalioglu<sup>7</sup> et al, in the present study, it was also noted that, there was no statistically significant association of Pneumatization of uncinat process with gender.

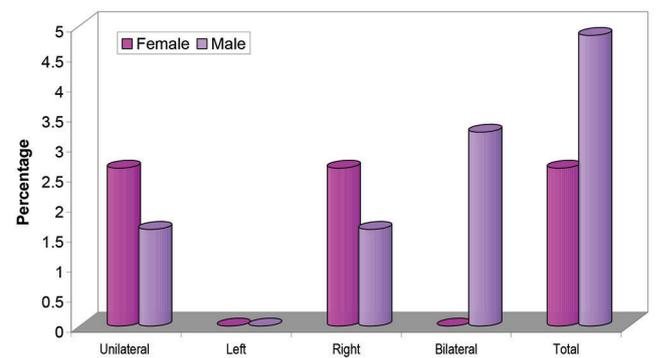
**CONCLUSION**

In the present study prevalence of extramural uncinat process

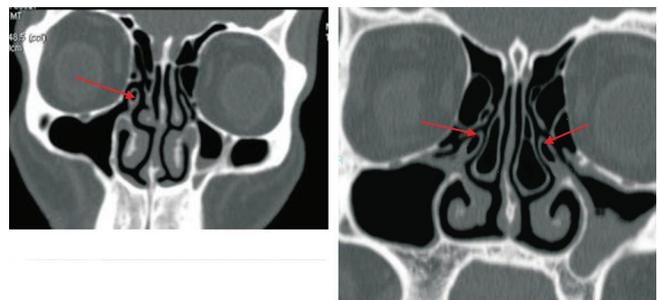
was observed to be high suggesting further work in this field to determine its correlation with pathological conditions of sino nasal region. Moreover, preoperative evaluation of variations of uncinat process and its pneumatization helps to avoid intraoperative damage to surrounding structures that alters normal ventilation.

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**Figure-1:** Bar diagram showing Genderwise comparison of prevalence of Uncinate process pneumatization.



**Figure-2a:** Coronal CT image showing unilateral extramural uncinat process (UP); **Figure-2b:** Coronal CT image showing bilateral extramural uncinat process

Extramural Uncinate process cells (UP pneumatization)	Females (n=38)		Males (n=62)		Statistical Significance	
	No.	%	No.	%	χ <sup>2</sup>	'p'
ABSENT	37	97.37	59	95.16		
PRESENT						
Unilateral	1	2.63	1	1.61	0.125	0.724
Bilateral	0	0.00	2	3.23	1.251	0.263
Total	1	2.63	3	4.84	0.299	0.585

**Table-1:** Genderwise comparison of Prevalence of extramural Uncinate process cells (UP pneumatization)

Author(year)	Population	N	Type of study	UP Pneumatization %
Bolger <sup>3</sup> et al. (1991)	Caucasian	202	CT	2.5
Badia <sup>4</sup> et al. (2005)	UK Population	200	CT	2
Mazza D <sup>11</sup> et al. (2007)	Italian	100	CT	5
Adeel <sup>1</sup> et al. (2012)	Pakistani	87	CT	5.2
K.Gupta <sup>2</sup> et al. (2012)	Indian	69	CT	4.34
Present Study (2014)	Indian	100	CT	4

**Table-2:** Prevalence of uncinat process (UP) pneumatization in different population.

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